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Same Subject, by the COMMITTEE of HUSBANDRY.

AN enquiry into the means whereby the injury of wheat in America from flies, may be lessened or prevented, is attended with difficulties and uncertainty here; because the members of the committee are at a distance from the immediate fears of observation, and cannot obtain that accurate knowledge of facts, which is requisite to insure the principles they adopt from errors. However, this is not thought a sufficient objection to their doing all in their power towards putting so interesting a research on a plan of investigation, and furnishing gentlemen, of learning and leisure, in the places where the mischief prevails, with hints that may serve as a basis to such a series of observations and experiments, as may probably be productive of the desired discovery.

It is said the injury of wheat from flies began in North-Carolina, about 40 years past, where it has been difficult to preserve it ever since, unless in spring-houses, or other cool places; and that the Indian corn of that country being of a soft and tender quality is also liable to be injured by the same insects, but may be preserved from them by keeping the cob covered with the under leaves of the husk.

THAT these mischievous flies have extended gradually from Carolina into Virginia, Maryland, and the Lower Counties, on Delaware; to the last of which places they did not arrive till seven years ago, and had not yet penetrated into Pennsylvania, or passed the Delaware. That in the transit they have been principally confined to low level moist lands; and when they have been found in high dry lands, they have been but few in number, and did not remain longer than one season. From whence we may rationally infer, that the high dry lands do not afford them equal conveniencies for subsistence and propagation, that the low level moist lands do, where many things conspire to make all grain raised in them, of a soft spongy quality, and peculiarly adapted to become the food and
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nefts of tender infects ; and therefore thofe are the places in which fuch infects will abound, and the wheat raifed in them, is the only kind which they can pierce and injure. The truth or falfhood of this inference may readily be afcertained, by experiments with different kinds of grain, put into a fly-infected granary. The following pertinent experiment is faid to have been often tried. Put three parcels of Indian corn into a place with fly-bitten wheat ; let one parcel be of the firft kind on the cob, and covered with the hufk ; a fecond of the hard flinty grains ; and the third of the foft tender grains, both the latter fhelled ; the firft and fecond will be injured, whilft the third is worm eaten in the fame manner as wheat.

THE accounts we have of thefe flies are various ; but the moft probable is, that they are whitifh butterflies or moths, which reft in the day, and are active in the night. They appear to be of the fame kind with thofe that do the like mifchief in Europe, which a gentleman of Angumois describes to Mr. Duhamel in the following manner.

“ THE great lofs, fays he, we have fuffered in our corn, and efpecially in our wheat, for 17 or 18 years paft, has put us on making ftrict enquiry into the caufes of a corruption with which our grain is infected. The common opinion is, that when the corn is in the bloom, that is to fay, in the month of June, fmall white butterflies lay their eggs in the flowers. When the grain is ripe, the eggs are inclofed in it, and as foon as the corn is laid up to be kept, it is found to ferment. This fermentation raifes an heat, which hatches the eggs, whence little worms proceed, which are transformed into chryfalides, and thefe are afterwards metamorphofed into grey butterflies or moths.”

THIS procefs of the flies in Europe, conforms with the obfervations of many gentlemen in America, fome of whom afert they have feen the perforations in the milky grains in the field, and in the dry grains of wheat, into which the flies had put their eggs. This is the lefs to be queftioned, fince it is the well known manner by which plumbs, cherries and fruit trees, are injured by other infects.

It is said the most considerable injury done to the wheat by flies in America, is after it is reaped and laid up, which the gentleman in Angumois does not mention to happen in Europe. For a few days after the chrysalides are metamorphosed into flies, these flies copulate, and impregnate more sound grains of wheat with their eggs, which again produce worms, chrysalides, and new parent flies ; whereby the number of worms is successively multiplied, and the mischief increased during the warm weather, but ceases in cold, and returns again in the spring. The spring flies are supposed to proceed from worms, hatched at that time in eggs, preserved in the grain through the winter ; because they are preceded by worms, are short lived, and never seen till the season is become warm ; and because very cold winters have been observed to lessen the number of flies the ensuing summer, which is supposed to be from the eggs being frozen, and destroyed in the grain. The gardeners in Europe preserve their fruit trees, and fruit, by carefully destroying the nests of those insects which injure them, and when the eggs of insects are deposited in any known place, or thing, it certainly would not be impracticable to prevent any mischief arising from them. Therefore in this enquiry it may be useful to know, how and where the wheat fly is preserved ; if in the wheat, it may be discovered by the following experiments. Expose to severe frost a quantity of wheat, that had been fly injured in the fall ; afterwards put this wheat, and an equal quantity of the same parcel, that had not been frosted, into different vessels, and keep them a due time in the degree of warmth requisite to hatch the eggs. If the facts are as above supposed, living worms will be found in the latter, but not in the former.

THE eggs of these flies have sometimes hatched, when the seasons have been extreme hot and moist, in the corn standing in the field. But this rarely happens till after it is stacked or housed, and a fermentation ensues.

THE common method of preserving wheat from harvest till it is threshed, especially in places most subject to the flies, is in stacks in the field. These stacks afford a remarkable phænomenon ;

menon ; for the south side of them, which is more immediately exposed to the rays of the sun, become soon heated, and hatch the eggs contained in the grains of wheat from the surface to about eighteen inches in depth, whilst no worms or flies are found deeper, or on the north side. If the degree of heat which hatches the eggs in the south side of the stack, and the degree in the north side, which preserves them without hatching, were ascertained by a thermometer, it would lead us to a means of preserving the grain, either by keeping it cool, and thereby preventing the hatching of the eggs, or heating it, so as to corrupt them, without injuring the corn ; for the difference of warmth in which eggs may be preserved, hatched, or corrupted, is but small ; “ 93 degrees of heat in 21 days gives growth to the chick in an hen’s egg, from a little speck into a perfect animal body ; but the same egg would be rendered unfit for producing a chick by a greater degree of heat, scarcely enduring 100 degrees without prejudice, and a much less degree than 93, would not suffice for hatching it.” The degrees requisite to hatch the eggs of these flies, to prevent their hatching, or to corrupt them, might readily be known, by putting the same kind of fly-injured wheat in different open vessels, and keeping them in different degrees of warmth, making 93, or the warmth of the prolific part of a stock, the medium standard.

ANOTHER experiment, of great importance in this enquiry, should be made at the same time, to discover whether the eggs of these flies can be hatched, or the worms exist, without the frequent accession of fresh air : This may be made, by trying a bladder close over a vessel, containing the above kind of wheat, and keeping it in the degree of warmth that will hatch the eggs ; and if the eggs in the open vessel hatch, whilst those in the covered one do not (which, philosophy teaches us, will probably be the case) it proves that securing the sheaves of corn from the access of fresh air, by covering them close in stacks or barns, with hay or straw, &c. and keeping the threshed grain in tight casks or granaries, will be an effectual preservative of the wheat from the injury of flies. It likewise proves, what is very useful to be known, that fly-injured

wheat in the holds of large vessels, or in deep bulk in granaries, will not receive further damage from insects, but on those surfaces which are exposed to the accession of fresh air.

THE following experiment on pease, is an encouragement to attempt the preservation of wheat, by excluding air from it. Take any quantity of English pease intended for seed, divide them into two parts, put one in an open vessel, keep the other in a vessel well corked ; that parcel to which the air has had admission, will be worm-eaten in the spring, whilst the other remains sound, and untouched by insects.

IT would be a great point gained, to destroy all these flies in granaries and mills, by poison vapour, if it could be easily done. But Mr. Duhamel says, no other vapour, but that from burning sulphur, which is injurious to the grain, will do it. This assertion is extraordinary, and the truth of it is to be doubted, since all other insects are readily killed by vapours of various kinds. “ If bones of animals, or hartshorn, are laid on an open fire, in a room where the smoke is confined, it will kill all the bugs, fleas and flies in that room : But the least nauseous, and yet the most deadly vapours, are from the suffocation of fire ; thus the spirits of charcoal, confined in a close room, kills the strongest animals in a short time ;” and therefore it may rationally be expected, that a pot of these coals fired, in a close granary, could not fail of destroying the flies in it in one night : However, there is no determining this matter *a priori*, because of the difference in respiration between animals and insects ; the former taking in air by the nostrils, and the latter by a perforation in the abdomen. But if the fumes of burning charcoal be inoffensive to the flies, it is probable that filling the room with a thick, pungent, oleaginous smoke, such as arises from burning the stems of tobacco, would soon destroy them, by clogging the air passages in the same manner as oil, which applied to the sides of insects, kills them immediately. Both these experiments may be easily tried, and if they fail, others suggested.

WHEAT

WHEAT being now in bloom, and the flies probably very busy in impregnating the tender grains with their eggs, all that can be done this season is, to prevent the hatching of those eggs, by threshing out the corn as soon as possible, and drying it in kilns or the hot sun, and keeping it afterwards in tight vessels, or deep bulk in close granaries: If it should heat in the vessels, it might be readily cooled, and kept so, by ventilating it an hour once a week, with a pair of common house bellows, according to Dr. Hale's direction.

It should not be stirred in bulk, if it can be avoided, that it may quickly encrust upon the top, and exclude the air.

If it is not convenient to thresh it out early, the sheaves should be defended from the accession of air, as before proposed, till late in winter, and afterwards kept in bulk, or tight vessels, to attempt the prevention of spring flies; for which purpose the wheat should be threshed out before spring.

If the stacks of wheat have not been preserved from the injury of the flies, the injured part should be threshed separately, and the wheat used immediately, or destroyed, or the eggs in it prevented from hatching: When flies appear in granaries, they should be killed immediately, to prevent their doing further mischief.

BUT as all these things require additional labour and expence, it is much to be wished the injury could be totally prevented; and which, it is reasonable to expect, may be attained solely by a proper change of seed-grain annually; that is, to sow the low moist lands with hard, dry, flinty wheat, of high mountainous lands, instead of their own product. For it is well known to naturalists, that the quality of fruit, grain and vegetables, depends on the climate and soil: The apples of a Newtown pippin-tree, growing in New-York and Virginia, have scarcely a resemblance in taste. The vine from which Burgundy wine is made in Burgundy, when transplanted into Champagne, produces Champagne wine, and the Champagne vine, transplanted into Burgundy, makes Burgundy wine.

Beans and pease from England, planted in America, soon dwindle much from the originals ; and the alteration that soils and climates produce on wheat is so well known, that all careful farmers in Europe change their seed-grain often ; this is so remarkable in America, it is observed, that the red flinty wheat which grows in the strong mountainous lands, when sowed in low moist places, undergoes a gradual change for four years, and then becomes light coloured, thin skinned, and of a soft texture ; and that this wheat sowed in the high lands, takes the same time to recover its natural colour and quality. Therefore if the injury of wheat from flies depends on the soft quality it contracts by its growth in moist low lands, a proper annual change of seed-grain, will alone prove an easy and certain remedy against the present destructive and alarming evil amongst us.

Observations on the native SILK WORMS of North-America,
by Mr. MOSES BARTRAM.

Read before the Society, March 11, 1768.

I H A D, for a long time, a desire to know, if some of the wild silk worms of North-America could, with proper care, be propagated to advantage ; accordingly, in March, 1766, I made an excursion along the banks of Schuylkill, in search of some pods or cocoons, in which the worms spin themselves up and lie concealed all the winter, in the nymph state, preparing for a change in the spring, namely, from an aurelia to a fly.

I WAS so lucky as to find five cocoons that had live found hymphæ in them. These five I placed in my garret opposite to a window, that fronted the sun rising. I did this, that the warmth of the sun might forward their coming out.

May 10. ONE of the flies came out ; but the window happening to be left open it made its escape.

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